

State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Aquatic Resources
Honolulu, Hawaii 96813

May 27, 2011

Board of Land
and Natural Resources
Honolulu, Hawaii

Request for Approval to Enter into a New 2011-2012 Federally-Funded (\$385,291) Department
of Land and Natural Resources (DLNR)/University of Hawaii (UH) Contract to Continue the
Work Performed under Contract No. 55137 for Evaluating the Effectiveness of Restricted
Fishing Areas for Improving the Bottomfish Fishery

Summary: The Division of Aquatic Resources seeks approval for a new contract with the University of Hawaii to evaluate the effectiveness of restricted fishing areas in improving the bottomfish fishery.

Background:

On February 25, 2011, under agenda Item F-2, the Land Board approved recommendations amending/extending Contract No. 55137 (Evaluating the Effectiveness of Restricted Fishing Areas for Improving the Bottomfish Fishery) with the University of Hawaii (UH). The February 25, 2011 submittal incorrectly stated that the UH would provide matching funds of \$136,130, instead of \$128,430, so an amendment was approved on April 21, 2011 (Item F-1) to correct the UH match (\$128,430). This request supersedes the two previous submittals (attached).

The U.S. Fish and Wildlife Service awarded the Division of Aquatic Resources (DAR) funding for a 6th year of the referenced bottomfish project. Upon Land Board and UH approvals, DAR submitted Supplemental Contract No. 5 to Contract No. 55137 for an anticipated FY12 to the Department of the Attorney General for approval as to form. It was then discovered that the original contract only allowed four (4) options for extension. DAR contacted the Department of Accounting and General Services, State Procurement Office (SPO), regarding continuation of the contract, but was informed by SPO that if continued services were needed a new contract must be entered.

Discussion:

Contracts for procurement of goods and services between governmental bodies are exempt from Chapter 103D (Hawaii Public Procurement Code), HRS, per section 103D-102.

The new contract will essentially adopt the terms and conditions proposed from the anticipated Supplemental Contract No. 5 to Contract No. 55137 under FY12 funding. No changes will be

made to contract costs, compliances or scope of services. The new contract will incorporate the previously reported funding terms, i.e., \$385,291 in federal funds with the UH providing in-kind match of \$128,430. The scope of services, as described in the attached research proposal by Dr. Jeff Drazen of the UH Department of Oceanography, includes: 1) assessment and monitoring of bottomfish populations inside and outside state Bottomfish Restricted Fishing Areas (BRFAs), using the BOTCAM baited drop camera systems; 2) analysis of collected and prior study data (i.e., collected in FY10 and FY11 under Contract No. 55137), including species identification, counts, and length data to assess relative abundance and size frequencies of harvested bottomfish species; 3) analysis of collected and prior study data for refinement of bottomfish essential fish habitat definitions in collaboration with the Division of Aquatic Resources (DAR), UH's Hawaii Undersea Research Laboratory and the National Oceanic and Atmospheric Administration's Pacific Islands Regional Office (NOAA-PIRO); 4) analysis of collect and prior study data to evaluate statistical power and to re-evaluate the sampling design for the BRFA monitoring; and 5) presentation to DLNR/DAR of a complete and detailed summary of findings. The term of this new contract is anticipated to run from July 1, 2011 through June 30, 2012, with five (5) one-year options for extension.

RECOMMENDATION:

Based on the attached proposed declaration of exemption prepared by the department after consultation with and advice of those having jurisdiction and expertise for the proposed actions under the contract:

1. That the Board declare that the actions which are anticipated to be undertaken under this contract will have little or no significant effect on the environment and is therefore exempt from the preparation of an environmental assessment.
2. Upon the finding and adoption of the department's analysis by the Board, that the Board delegate and authorize the Chairperson to sign the declaration of exemption for purposes of recordkeeping requirements of chapter 343, HRS, and chapter 11-200, HAR.
3. That the Board authorize the Chairperson to negotiate and, subject to necessary approvals, enter into a new Contract with the University of Hawaii under the terms indicated above to study the effectiveness of restricted fishing areas in improving the bottomfish fishery."

Respectfully submitted,



FRANCIS G. OISHI
Program Manager

APPROVED FOR SUBMITTAL:



WILLIAM J. AILA, JR
Chairperson

Attachments

State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Aquatic Resources
Honolulu, Hawaii 96813

April 21, 2011

Board of Land
and Natural Resources
Honolulu, Hawaii

Amend Prior Board Action to Correct the UH Match Amount (\$128,430) in
February 25, 2011, Item F-2: Request for Approval to Add Federal Funding (\$385,291) and
Extend through FY12 the Department of Land and Natural Resources (DLNR)/University of
Hawaii (UH) Contract No. 55137 for the Project Titled Evaluating the Effectiveness of
Restricted Fishing Areas for Improving the Bottomfish Fishery

Background:

The Land Board at its meeting of February 25, 2011, under agenda Item F-2, approved recommendations authorizing the Chairperson to negotiate and, subject to necessary approvals, amend/extend Contract No. 55137 with the University of Hawaii. The original submittal incorrectly stated that the UH would provide the required matching funds of \$136,130, when the correct match figure was actually \$128,430.

This submittal is to correct the match amount. Due to higher internal costs, the UH will only be able to provide the minimum required grant match of 25% of the total contract amount, i.e., \$128,430, towards the U.S. Fish and Wildlife Service Sport Fish Restoration grant funding the contract. With the federal funding amount of \$385,291 and the corrected UH matching funds amount of \$128,430, the rounded total project amount would be \$513,721. The contract amount and all other information in the February 25, 2011 submittal remain the same.

Chapter 343 – Compliance with Environmental Law:

Contract No. 55137 involves the use of state lands (submerged lands zoned in the Conservation District, Resource subzone) and approval for use of state funds. See Agency's Declaration of Exemption (attached) from preparation of an environmental assessment. A Declaration of Exemption was prepared for Dr. Donald Kobayashi with the Pacific Islands Regional Science Center, National Marine Fisheries Service, Special Activity Permit 2011-54 for bottomfish research, and approved by BLNR at its February 25, 2011 meeting. Dr. Drazen's work is covered under this Permit. As the state funds encumbered through this revised UH matching amount for Contract No. 55137 only represent another trigger for environmental analysis of contemplated activities under Dr. Kobayashi's special activity permit, the same exemption analysis should apply.

**Approved By The Board Of
Land & Natural Resources
At Its Meeting Held On
APR 21 2011**


ITEM F-1

RECOMMENDATION:

"That the Board amend the prior Board Action of February 25, 2011, Agenda Item F-2, to reflect the change in grant match provided by the UH from \$136,130 to \$128,430.

That the Board also recognize and adopt DLNR's prior Declaration of Exemption prepared for Dr. Donald Kobayashi's special activity permit no. 2011-54, because this anticipated usage of state funds of the University of Hawaii in Contract No. 55137 applies to and coincides with the prior exemption analysis of the same contemplated activities for purposes of compliance with chapter 343, HRS."

Respectfully submitted,



FRANCIS G. OISHI
Program Manager

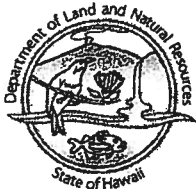
APPROVED FOR SUBMITTAL:



WILLIAM J. AILA, JR.
Chairperson

Attachment

NEIL ABERCROMBIE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

February 25, 2011

WILLIAM J. AILA, JR.
INTERIM CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
GUY KAULUKUKUI
FIRST DEPUTY
WILLIAM M. TAM
INTERIM DEPUTY DIRECTOR - WATER
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAIHOLAWE ISLAND RESERVE COMMISSION
LAND
STATS PARKS

TO: Division of Aquatic Resources File

THROUGH: William J. Aila, Jr., Interim Chairperson

FROM: Robert Nishimoto, Aquatic Biologist
Division of Aquatic Resources

JO for RN

SUBJECT: Declaration of Exemption from the Preparation of an Environmental Assessment under the Authority of Chapter 343, HRS, and Chapter 11-200, HAR, for a Special Activity Permit to Dr. Donald R. Kobayashi, Pacific Islands Fisheries Science Center, NOAA, for studies on Hawaii State deep-seven bottomfish and jacks.

The following permitted activities are found to be exempted from preparation of an environmental assessment under the authority of Chapter 343, HRS and Chapter 11-200, HAR:

Project Title: Special Activity Permit to Dr. Donald R. Kobayashi, Pacific Islands Fisheries Science Center, NOAA, for studies on Hawaii State deep-seven bottomfish and jacks.

Permit Number: SAP 2011-054.

Project Description: The research permit, as described below, would allow up to 500 takes of all seven species of State regulated deep-seven bottomfish, including within bottomfish restricted fishing areas (BRFAs), and 20 each of three species of jacks. There are three parts of the study – 1) to gather life history data on age, growth, abundance, spawning and size at maturity, 2) to gather data on incidentally caught species of the deep slope bottomfish ecosystem habitat to understand their population structure and the predator/prey relationship with juvenile bottomfish, including sampling the stomach content of potential predators of juvenile bottomfish, and 3) tag and release viable adult specimens that are not exhibiting signs of barotrauma or subsequently sampled for stomach contents, if external tags are available. The permit would allow the continuation of research activities even after the annual closure of the bottomfish fishing year has been declared. This is needed to continue to gather data on the deep-7 bottomfish throughout the life cycle of the regulated species throughout the year. The fishery is currently one of the most heavily regulated fisheries being managed under a Total Allowable Catch limit, bag limits, closed areas, and gear restrictions.

Consulted Parties: Not applicable.

Exemption Determination: After reviewing HAR § 11-200-8, including the criteria used to determine significance under HAR § 11-200-12, DLNR has concluded that the activities under this permit would have minimal or no significant effect on the environment and that issuance of the permit is categorically exempt from the requirement to prepare an environmental assessment based on the following analysis:

1. All activities associated with this permit have been evaluated as a single action. Since this permit involves an activity that is precedent to a later planned activity, i.e the collection of field data throughout the permit period, the categorical exemption determination here will treat all planned activities as a single action under § 11-200-7, HAR.

2. The Exemption Class for Scientific Research with no Serious or Major Environmental Disturbance Appears to Apply. HAR § 11-200-8.A.5. exempts the class of actions which involve "basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource." This exemption class has been interpreted to include the research on animals, such as those being proposed.

In addition, the activities under consideration are exempt under Exemption Class #5, Exempt Items #3, #4, and #5, respectively, which include "placing recording devices in the field to determine animal movement," as well as "wildlife and game surveys, censuses, inventories, studies..." and "...marine surveys and research activities...." Department of Land and Natural Resources, Exemption List for the Division of Fish and Game, approved January 19, 1976.

The proposed acoustic monitoring activities here appear to fall squarely under the exemption class identified under HAR § 11-200-8.A.5. and as described under the 1976 exemption list class items. As discussed below, no significant disturbance to any environmental resource is anticipated. Thus, so long as the below considerations are met, an exemption class should include the action now contemplated.

3. Cumulative Impacts of Actions in the Same Place and Impacts with Respect to the Potentially Particularly Sensitive Environment Will Not be Significant. Even where a categorical exemption appears to include a proposed action, the action cannot be declared exempt if "the cumulative impact of planned successive actions in the same place, over time, is significant, or when an action that is normally insignificant in its impact on the environment may be significant in a particularly sensitive environment." HAR § 11-200-8.B. To gauge whether a significant impact or effect is probable, an exempting agency must consider every phase of a proposed action, any expected primary and secondary consequences, the long-term and short-term effects of the action, the overall and cumulative effect of the action, and the sum effects of an action on the quality of the environment. HAR § 11-200-12.

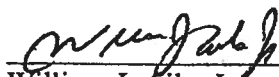
Significant cumulative impacts are not anticipated as a result of this activity, and numerous safeguards further ensure that the potentially sensitive environment of the project area will not be significantly affected. All activities will be conducted in a manner that does not diminish marine resources, qualities, and ecological integrity, or have any indirect, secondary, cultural, or cumulative effects.

Since no significant cumulative impacts or significant impacts with respect to any particularly sensitive aspect of the project area are anticipated, the categorical exemptions identified above should remain applicable.

4. Overall Impacts will Probably have a Minimal or No Significant Effect on the Environment.

Any foreseeable impacts from the proposed activity will probably be minimal, and further mitigated by general and specific conditions attached to the permit. Specifically, all research activities covered by this permit will be carried out with strict safeguards for the natural, historic, and cultural resources, other applicable law and agency policies and standard operating procedures.

Conclusion. Upon consideration of the permit to be approved by the Chairperson, being delegated signatory authority on behalf of the Board of Land and Natural Resources at its meeting of October 24, 2008, the potential effects of the above listed project as provided by Chapter 343, HRS, and Chapter 11-200, HAR, have been determined to be of probable minimal or no significant effect on the environment and exempt from the preparation of an environmental assessment.



William J. Aila, Jr.
Interim Chairperson,
Board of Land and Natural Resources

2/25/11

Date

State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Aquatic Resources
Honolulu, Hawaii 96813

February 25, 2011

Board of Land
and Natural Resources
Honolulu, Hawaii

Request for Approval to Add Federal Funding (\$385,291) and Extend through FY12 the
Department of Land and Natural Resources (DLNR)/University of Hawaii (UH) Contract
No. 55137 for the Project Titled Evaluating the Effectiveness of Restricted Fishing Areas for
Improving the Bottomfish Fishery

Submitted herewith for your consideration is a request to amend and extend Contract No. 55137 between DLNR and the UH. Supplemental Contract No. 5 will provide additional Federal funding and allow continuation of the on-going fisheries project titled "Evaluating the Effectiveness of Restricted Fishing Areas for Improving the Bottomfish Fishery." The bottomfish project is under the direction of Dr. Jeff Drazen of the UH's Department of Oceanography. Supplemental Contract No. 5 extends the project from July 1, 2011 through June 30, 2012 and provides \$385,291 in Federal funds from a U.S. Fish and Wildlife Service Sport Fish Restoration grant. The UH will provide the required match (\$136,130). No State General Funds are being used for the Contract.

The goal of the bottomfish project is to evaluate the effectiveness of the Division of Aquatic Resources (DAR) bottomfish management plan by determining how restricted fishing areas (RFAs) affect bottomfish populations inside and outside their boundaries. A non-lethal video assessment tool, the BOTCAM stereo-video baited camera system, is used to collect baseline data for determining 1) if bottomfish populations on habitats inside the bottomfish restricted fishing areas (BRFAs) improve (i.e. increase in numbers and average size of fish) after the closures take effect, and if so 2) if bottomfish populations on adjacent habitats outside the BRFAs also improve (as a result of spillover), or 3) if bottomfish populations on adjacent habitats outside the BRFAs diminish (decrease in numbers and average size of fish) as a result of displaced fishing effort. Data collected from these surveys and previous surveys is then processed and analyzed for use in helping the DLNR evaluate the effectiveness of the State's closed area management plan for this fishery.

In FY12 the following will be performed:

1. Continue assessments and monitoring of bottomfish populations inside and outside the State's BRFAs, using the BOTCAM baited drop camera systems.

Approved By The Board Of
Land & Natural Resources
At Its Meeting Held On

FEB 25 2011

ITEM F-2

2. Continue to analyze the video completing analysis of the FY10 and FY11 collected data. This includes species identification, counts, and length data to assess relative abundance and size frequencies of harvested bottomfish species.
3. Continue analysis of data for refinement of bottomfish essential fish habitat definitions in collaboration with the Division of Aquatic Resources (DAR), UH's Hawaii Undersea Research Laboratory and the National Oceanic and Atmospheric Administration's Pacific Islands Regional Office (NOAA-PIRO).
4. Continue analysis of the data to evaluate statistical power and to re-evaluate the sampling design for the BRFA monitoring.
5. Present the DLNR/DAR with a complete and detailed summary of findings.

Supplemental Contract No. 5 to Contract No. 55137 is currently being reviewed for approval by the UH and thereafter will be submitted to the State's Department of the Attorney General for final approval as to form.

RECOMMENDATION:

"That the Board authorize the Chairperson to negotiate and, subject to necessary approvals, amend/extend Contract No. 55137 with the University of Hawaii."

Respectfully submitted,



FRANCIS G. OISHI
Program Manager

APPROVED FOR SUBMITTAL:



WILLIAM J. AILA, JR.
Interim Chairperson

RESEARCH PROPOSAL

**Evaluating the Effectiveness of Restricted
Fishing Areas for Improving the Bottomfish
Fishery in the Main Hawaiian Islands**

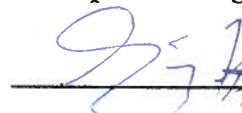
To: Francis Oishi, Administrator
State of Hawai'i
Division of Aquatic Resources
Department of Land and Natural Resources
1151 Punchbowl Street
Honolulu HI 96813

From: University of Hawai'i
2530 Dole Street, Sakamaki Hall D-200
Honolulu HI 96822

Effective Dates: July 1, 2011 through June 30, 2012

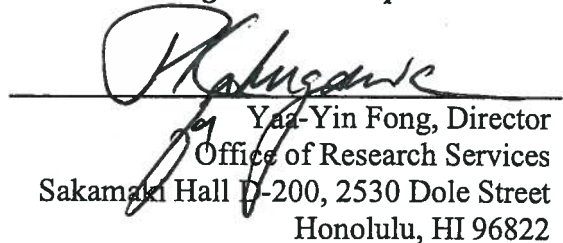
Requested Amount: \$385,291

Principal Investigator: Jeffrey C. Drazen

 *signing on behalf of
Jeffrey Drazen

Department of Oceanography
University of Hawai'i
1000 Pope Road, MSB 606
Honolulu, HI 96822
Phone: (808) 956-6567, Fax: (808) 956-9516
Email: jdrazen@hawaii.edu

Authorized Organization Representative:


Yaa-Yin Fong, Director
Office of Research Services
Sakamaki Hall D-200, 2530 Dole Street
Honolulu, HI 96822

January 30, 2011

SUMMARY OF EXPECTED ACCOMPLISHMENTS

This proposal is being submitted to the Department of Land and Natural Resources, Division of Aquatic Resources (DAR), to assist them with their efforts in improving the bottomfish fishery in the main Hawaiian Islands (MHI). On July 1, 2007, the closure of DAR's twelve, newly designed bottomfish Restricted Fishing Areas (BRFAs) will take effect. These areas were established for three purposes:

- 1) reduce fishing mortality of MHI bottomfish stocks by 15%
- 2) rebuild bottomfish populations on habitats inside the BRFAs
- 3) improve bottomfish populations in adjacent open fishing areas via larval export and/or adult spillover from the BRFAs

This project is designed to provide DAR with baseline data for evaluating whether the last two objectives are achieved. Monitoring these areas to determine their effectiveness will require a long time series (5-10 yrs). This proposal is for funds to complete the fifth year of the study. We will continue to use a non-lethal assessment tool developed by NOAA Fisheries Coral Reef Ecosystem Division (CRED) to obtain species presence/absence, counts, and size distributions. The BOTCAM is a remote fully automated stereo-video baited camera system rated to a depth of over 300 m. To date we have performed 1212 45-minute bait stations in areas both inside and outside of six of the twelve BRFAs and in the Kahoolawe Island Reserve. We have developed a database of all the environmental, fish, and habitat data we have collected. We have also developed a new more robust video recorder for use on BOTCAM. We also identified new nursery habitats for juvenile opakapaka. Finally we have evaluated the first year baseline abundance and size data for the 6 BRFAs finding significant differences between BRFAs and between different habitat types. Two of the pre-existing BRFAs and KIR both exhibit protection effects detectable in length-frequency distributions but not in relative abundance. This project year we propose to monitor only Penguin Bank (BRFA F), in order to focus on data analysis and processing. We feel that more time is needed to see changes in bottomfish populations because of their life histories (long lived), the variance now evident in the data, and the need to re-evaluate the intensity and nature of sampling at any given area. The sampling design for each BRFA has been developed in collaboration with the NOAA Fisheries Pacific Islands Science Center and the University of Miami. Digitized video files will be collected during these bait stations and analyzed at the University of Hawai'i's Oceanography department. A full report of the findings will be provided to DAR at the end of the fiscal year.

BACKGROUND AND PROJECT JUSTIFICATION

The most important members of the Hawaiian bottomfish fishery are four species of eteline snappers, the onaga, *Etelis coruscans*, the ehu, *Etelis carbunculus*, the 'ōpakapaka, *Pristipomoides filamentosus*, the uku, *Aprion virescens*, and one endemic species of grouper, the hāpu'upu'u, *Epinephelus quernus*. Four of these, the onaga, ehu, 'ōpakapaka, and hāpu'upu'u are considered to be deeper complex species whose essential fish habitat (EFH) is presently defined as the 100-400 m depth range around each island and bank in the Hawaiian archipelago. From 1986-2004, DAR and WPFMC assessed the stocks of these species in the main Hawaiian Islands (MHI), as well as the Northwestern Hawaiian Islands (NWHI) by, among other ways,

calculating their estimated Spawning Potential Ratios (SPRs) from annual commercial catch data. An SPR of 20% was established as the critical threshold for designating a stock as recruitment overfished. In the NWHI, SPRs for all bottomfish species have consistently been above this critical level however in the MHI, the onaga and the ehu have had SPRs below 20% for well over a decade. Since the data from these two regions were reported separately until 1999, MHI onaga and ehu were considered to be separate stocks from NWHI onaga and ehu. Therefore, when the Magnuson Fisheries Act was revised in 1996, they were federally listed as recruitment overfished.

The amended Magnuson Act, now referred to as the Magnuson-Stevens Act, imposed a mandate on WPRFMC to restore the stocks of species listed as overfished to healthy levels (i.e., SPR > 20%) within a ten-year time period. Since most of the MHI bottomfishing grounds are within state rather than federal waters, WPRFMC turned to DAR to address this problem. In 1997, DAR responded by creating a new bottomfish management plan and funding research on bottomfish to provide additional information on these species. A key element in the plan (Hawai'i Administrative Rules, Chapter 13-94, Bottomfish Management) was the creation of nineteen bottomfish restricted fishing areas (BRFAs) where bottomfishing was prohibited. The BRFAs were spread throughout the MHI and were designed to protect 20% of the designated 100-400 m essential fish habitat (EFH) for onaga and ehu. The closure of these areas took effect on June 1, 1998 and their effectiveness, in terms of the quantity and type of habitat protected and their effect on commercial landings, was subsequently reviewed in 2005. It was concluded that the system did not protect an adequate amount of preferred habitat. For example, onaga and ehu appear to aggregate over high relief having hard, structurally complex substrates (WPRFMC 1998). Only 5% of this type of habitat was believed to occur within the boundaries of the BRFAs. DAR's commercial catch data analysis furthermore indicated that modifications to the BRFA system were warranted.

A new BRFA system was therefore created, this time with a much greater understanding of the distribution of MHI bottomfish habitat as a result of the multibeam sonar mapping which has taken place throughout much of the Main Hawaiian Islands during the last 8 years. The number was reduced from 19 to 12 and their boundaries were designed to protect selected habitats but also to facilitate spillover and thereby sustain adjacent habitats open to fishing. The new system took effect on July 1, 2007 and both fisheries biologists at DAR and NOAA's Pacific Islands Fisheries Science Center (PIFSC) have stressed the importance of obtaining baseline data as well as population monitoring, which were lacking for the areas in the original system. Furthermore, some PIFSC biologists are concerned about the possibility of displaced fishing effort causing greater depletion of the areas surrounding the BRFAs.

PROJECT STATEMENT OF WORK

The goal of this project is to evaluate the effectiveness of DAR's bottomfish management plan by determining how RFAs effect bottomfish populations inside and outside of their boundaries. Our objectives are to use a non-lethal video assessment tool, the BOTCAM stereo-video baited camera system, to collect baseline data for determining 1) if bottomfish populations on habitats inside the BRFAs improve (i.e., increase in numbers and average size of fish) after the closures take effect, and if so, 2) if bottomfish populations on adjacent habitats outside the BRFAs also improve (as a result of spillover), or 3) if bottomfish populations on adjacent

habitats outside the BRFA's diminish (decrease in numbers and average size of fish) as a result of displaced fishing effort. All three of these objectives will be achieved by first employing a standardized BOTCAM sampling protocol to create a large video dataset of bottomfish populations inside and outside of the BRFA's. This dataset will be subsequently analyzed to address each objective separately. The timeframe required to obtain meaningful answers is expected to vary in the following manner:

Objective 1: 5-10 years

Objective 2: over 10 years

Objective 3: 1-5 years

Due to budget constraints, only six of the 12 BRFA's in the new management plan are being assessed during the course of this project (BRFA's B, D, E, F, H, L). These were selected on the basis of logistics as well as other factors such as habitat type, topography, and whether they were new or continuing closed areas. This year we propose to sample BRFA F, Penguin Bank but at twice the intensity we have previously been sampling (128 deployments instead of 64). Descriptions of the standardized BOTCAM protocols, a description the BRFA being sampled this year, and a description of our planned data extraction and processing protocol are given below. We also propose to annotate all of the videos we have collected from years 2-4 and analyze the data to generate species-specific habitat associations which will be habitat scale dependant. We also will evaluate changes in bottomfish abundance and size across our existing time series (years 1-3).

1.0 BOTCAM Description

The Bottom Camera Bait Station (BOTCAM) is a stereo video system that is deployed on the seafloor to monitor commercially important bottomfish (Fig. 1). It has been developed by the PIFSC Coral Reef Ecosystem Division and details of its design can be found at <http://www.pifsc.noaa.gov/cred/botcam.php> and in Merritt (2005) and Merritt et al.(2011). It has an operating depth of 350m and provides a non-extractive, and hence very attractive, method to monitor fish populations within RFAs. The system consists of two video cameras which are programmed to take images once the system is in the water. Numbers of fishes and their identity are determined in addition to other variables as discussed below (3.0). The stereo camera arrangement facilitates size and distance determinations of fish and habitat features in the field of view.

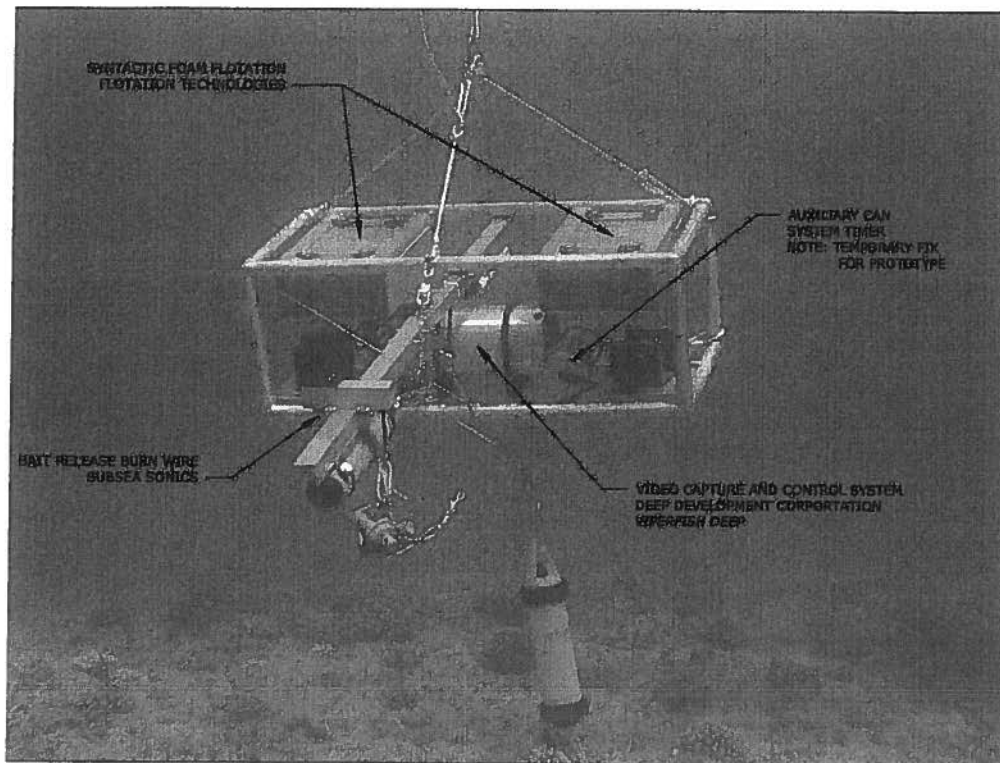


Fig. 1. BOTCAM shown on the seafloor.

1.1 BOTCAM Standardized Site Selection and Deployment Protocols

After consultation with the Pacific Islands Fisheries Science Center (M. Parke, G. DiNardo, J. Brodziak) and the University of Miami (J. Ault), a standardized BOTCAM sampling protocol was developed for this project. The design of the protocol was based on the assumption that sampling effort should be correlated to habitat suitability because it, in turn, is correlated to bottomfish abundance. As mentioned above, previous studies have found that adult bottomfish often associate with higher relief and/or rocky substrate (Polovina et al. 1985; WPRFMC 1998). Based on a study on Penguin Banks, this type of substrate is patchy, and may make up only a fraction of the total substrate within their depth range (Haight 1989). Onaga and ehu may be attracted to these areas because they provide suitable habitat for their prey. Both species are primarily piscivorous (Haight 1990; Haight et al. 1993) and recent studies found a positive correlation between their presence and the presence of several species of small fish they may be feeding on (Conklin et al. 2000; Kelley et al. 1997). Furthermore ehu, the smaller of the two species, seem to require shelter (Kelley et al. 2000; Kelley et al. 1997) which this type of substrate also provides. Onaga adults appear to feed on fish in the water column and therefore their attraction to these areas could also be related to current flow and its effect on prey density (Ralston et al. 1986) (Haight et al. 1993).

Multibeam data now exists for the entire bottomfish EFH in the main Hawaiian Islands. Depth, substrate hardness, and slope are all habitat variables that can be filtered from the bathymetry and backscatter data in ArcGIS. Furthermore, intercepts of these variables can also

be extracted to provide combinations that represent different habitat types. Given that backscatter values can typically range from 0-255 while slopes can range from 0-90°, an enormous number of combinations could theoretically be generated. This process was therefore simplified by first, filtering the bathymetry data for the 100-300 m range, selecting a single “boundary value” of 20° for high/low slopes, and selecting a single boundary value for hard/soft substrates which varied according to the multibeam sonar system used and how the raw data were initially processed. Filtering and creating intercepts of the values above and below these boundaries yielded four simplified habitat types labeled as hard substrate/high slope, hard substrate/low slope, soft substrate/high slope, and soft substrate/low slope. Each type was then assigned a habitat suitability index value ranging between 1 for “soft/low” to 3 for “hard/high”. The amount of sampling effort in each habitat type could then be varied proportionally by establishing BOTCAM “units of effort” that would be multiplied by the suitability index values. For this project, each BOTCAM unit of effort was selected to be 4 deployments. However, it is now clear that this may be insufficient to give us the necessary statistical power to evaluate protection effects after controlling for substrate interactions.

Table 1 summarizes the outcome of this process, which generated a sampling requirement of 64 deployments in and around each of the 6 selected BRFAs. The extent of the 100-300 m depth range to be sampled outside of the boundaries was based on measuring the linear distance of the 200 m contour line inside the RFA. A similar distance was measured along the 200 m contour line outside of each side of the RFA to establish the boundaries of the outside sampling zones. In addition, when features such as isolated pinnacles were enclosed in the RFA, attempts were made to include similar features in the outside sampling zone as well.

Table 1: Summary of the Standardized BOTCAM Sampling Protocol for each RFA. The numbers in columns 3-5 represent the number of BOTCAM deployments.

Habitat Type	Suitability Index	Inside RFA	Outside RFA	Combined
Hard substrate/high slope	3	12	12	24
Hard substrate/low slope	2	8	8	16
Soft substrate/high slope	2	8	8	16
Soft substrate/low slope	1	4	4	8
Total Deployments		32	32	64

To select deployment locations, the sampling areas were gridded and assigned one of the 4 habitat types. A grid cell size of 200x200m was chosen to reflect an area from which the fish would likely be drawn to the bait and large enough to provide an adequate target for deployment. The area of each of the 4 habitat types present in each grid cell was determined using the ArcGIS Spatial Analyst extension. The habitat type with the highest percentage of the cell’s area was chosen to represent the cell. The majority habitat type was >50% of the area in 95% of the grid cells. Seventy-five percent of the grids contained >70% coverage of its majority habitat type. Grid cells were chosen for sampling using a random selection procedure contained within the ArcGIS software package.

Hard copy maps and lists of the deployment sites will be created prior to the field work taking place. Three BOTCAMs will be taken out on each trip with a chartered vessel. On site, a standardized protocol will be followed for each BOTCAM deployment. A pre-made ground, raw fish/squid mix will be loaded into a lobster trap bait canister that is fixed onto the BOTCAM arm near the location of the synchronization device. The camera system will be triggered on the back deck just prior to deployment so that the unit will be recording when it arrives on the bottom. The system will be left on the bottom for between 45-60 minutes to ensure that a minimum of 30 minutes of video is recorded.

2.0 Description of site selection for field work

Bottomfish population data for BRFA F, will be collected over the course of the 2011-2012 fiscal year beginning July 1, 2010 and ending June 30, 2011. BRFA F was chosen as the continuously sampled site because Penguin Bank is heavily fished and it represents a significant portion of the total bottomfish EFH in the main Hawaiian Islands. In addition it is logistically accessible from the island of Oahu.

A split panel design had been adopted in the first year of the project to balance continuous monitoring of BRFA F with repeated sampling (every other year) at the other sites (Table 2). We are departing from this plan because our data analysis suggests that we need to reevaluate the tradeoffs between spatial coverage and intensity in our sampling. Also the long life history of these species will require a greater number of years to pass before large and significant changes (if they occur) will be evident with our Botcam sampling.

Table 2. BRFA split panel sampling design for the course of the project.

BRFA	BRFA type	Project year					
		1	2	3	4	5	6
B	continuing	X	X		X		X
D	new	X		X		X	X
E	partial new	X	X		X		X
F	partial new	X	X	X	X	X	X
H	new	X	X		X		X
L	continuing	X		X		X	X

3.0 BOTCAM Data extraction and processing protocol.

The data extraction and processing protocol has been formalized in conjunction with NOAA-CRED and HURL. An MS Access database has also been developed to assist in

archiving and analyzing the data. The following information will be extracted from the 30 minutes of video obtained during each deployment:

Habitat classification

- 1) general substrate type – (hard or soft)
- 2) general slope - (high or low)
- 3) specific substrate type – bedrock, boulders, cobbles/pebbles, sediment
- 4) bottom relief
- 5) presence of cavities/caves

Bottomfish information

- 1) Presence/absence for each of the major bottomfish species.
- 2) Overall MAXNO: The maximum number of fish of each species observed in a single frame during the 30-minute deployment.
- 3) Interval MAXNO: The maximum number of fish of each species observed in a single frame during each 1-minute interval of the deployment. This will yield 30 interval MAXNOs for each species for each deployment.
- 4) Time of first arrival: The time between the start of the deployment (when BOTCAM touches down on the bottom) and when the first individual of each species was observed.
- 5) Arrival rates: the rate at which subsequent individuals of each species are observed on video.

Other data that will be extracted from the video including fish sizes (forklengths). These will be obtained using the software package called Photomeasure. The software allows for a calibrated stereo-grammetric analysis of the synchronized output from the two cameras. System calibrations are performed in a pool prior to each major field effort.

Relative abundances of each fish species will be estimated based on the variables described above. Existing models come from work done in deep-water environments. There is an inverse relationship between time of first arrival and fish density because bait placed in high density areas will be detected more quickly and fishes are more likely to be close to the location where it was dropped. Arrival rate and maxno positively correlate with density (Bailey and Priede 2002; Priede and Merrett 1998; Yau et al. 2001). The overall and interval MAXNOs are count data, which typically are not normally distributed. Therefore these data will be subjected to a protocol based on a negative binomial distribution. Forklength measurements should be normally distributed and therefore will be subjected to ANOVA. To address our objectives the relative abundance variables and size frequency data will be used to assess changes over time, differences between BRFAs and adjacent areas, and differences between habitat types.

4.0 Data analysis

In this year of the project we propose to focus on video annotations (data processing) and data analysis. To this end project personnel will spend more time on these tasks and less on the field efforts. In addition we will hire two undergraduates and one full time video analyst. This will require the purchase of additional software licenses to process the video data. We will continue to employ a postdoctoral fellow to assist in data analysis and report/publication writing.

We will finalize publication of the first year baseline analysis and we will analyze in detail the species-specific habitat associations of the deep 7. We hope that this information will help inform us on our field sampling design and to assist in understanding the suitability of habitat with the BRFAs.

Statistical analysis of count data such as that derived from the botcam field work is challenging. It is hyperdispersed due to the schooling nature of most of the deep7 species and our analysis of the relative abundance in the first year suggests a large amount of variance. Therefore the assumptions of conventional parametric statistics are violated. We have already taken a non-parametric approach to data analysis using permutational ANOVA (PERMANOVA). However in this year we will also explore general linear/nonlinear mixed models (GAMMs) using the negative binomial distribution (Krebs 1999) in the statistical program R. Such approaches are increasingly being used in the ecological and fisheries literature (e.g. Bailey et al. 2009).

PROJECT MANAGEMENT

Dr. Jeffrey C. Drazen is Principal Investigator of this project and will provide overall management and coordination of activities for this project. He will directly oversee the fieldwork and data analysis associated with objectives 1-4.

PROJECT BUDGET AND BUDGET JUSTIFICATION

The total funding request is \$385,291 for the period July 1, 2011 to June 30, 2012. These funds will cover the following costs:

- Salaries and Benefits for 3.67 project staff members (3.25 research associates, 1 postdoctoral researcher and 2 months for the PI), with support for one graduate student.
- Expendable and non-expendable supplies for the fieldwork and data analysis, software and equipment servicing and repairs.
- Travel to present our results at one scientific conference.
- Other: Boat charters of: the Huki Pono (Sea Engineering) for the purpose of conducting the offshore tasks required of the research project.
- Indirect costs on the modified total direct costs (MTDC) at a rate of 6% for research primarily conducted at UH Department of Oceanography.

The DAR award requires "matching funds" of \$128,430 for the requested federal award. This amount is being provided by 1.89 months of salary from the PI and the University of Hawai'i difference of the indirect cost rate of 35.7% (36.7% for "on-campus research less 1% to eliminate all statewide central services from the UH negotiated rate) and 6% of the MTDC for research conducted at UH.

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Project Budget

Period: July 1, 2011 - June 30, 2012

Evaluating the Effectiveness of Restricted Fishing Areas for Improving the Bottomfish Fishery in the Main Hawaiian Islands

Jeffrey C. Drazen, PI

Version: 3/31/2011

Description	DAR
Salaries and Wages	\$237,345
Research Associate (100%)	40,621
Research Associate (50%)	26,693
Research Associate (75%)	33,330
Postdoctoral Researcher (100%)	57,000
Principal Investigator (16.7%)	16,679
Graduate student	23,022
Research Associate (100%)	40,000
undergraduate students	0
Fringe Benefits (35%, RA 10%, UG 1.1%, PI 39%)	\$77,729
Research Associate (100%)	14,217
Research Associate (50%)	9,342
Research Associate (25%)	11,666
Postdoctoral Researcher (100%)	19,950
Principal Investigator (16.7%)	6,505
Graduate student	2,049
Research Associate (100%)	14,000
undergraduate students	0
Materials and Supplies	\$9,008
BOTCAM supplies and data storage	3,008
RCF computer fees and software	3,500
publication charges	2,000
equipment repair and servicing	500
Travel (Domestic)	\$3,000
participation in scientific conference	3,000
Other: Rentals	\$36,400
Boat Charter \$2600/day x 14 days	36,400
Direct Costs	\$363,482
Total Modified Direct Costs	\$363,482
Indirect Costs (6% of MTDC)	\$21,809
TOTAL FROM DLNR	\$385,291
Match from UH*	\$128,430
Project Total	\$513,721

* The indirect cost differential is between 6% of MTDC and 35.7% (36.7% which is normally charged for research programs less 1% to eliminate all statewide central services from the University negotiated rate). Calculation: Differential on indirect costs (\$129,763 less \$21,809 yields \$107,954 in potential match from UH indirect cost differential. Additional match is composed of 1.89 months of salary for PI at \$20,476